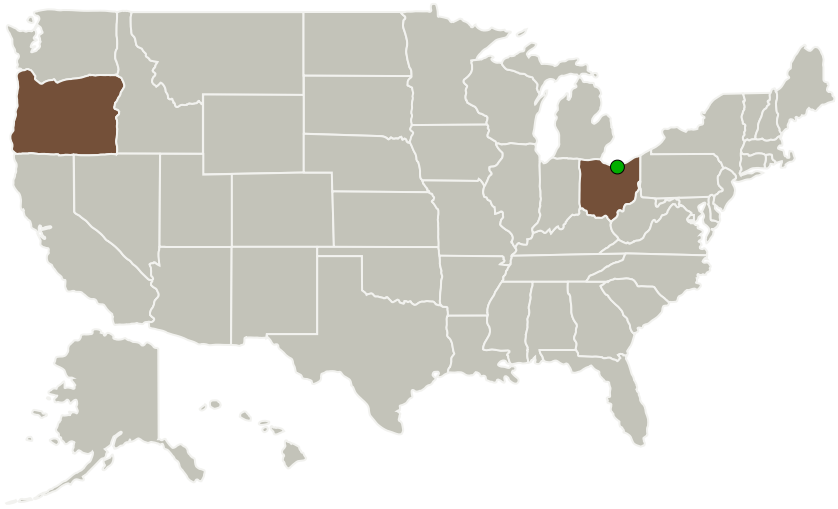
ISS Testbed for Capillary Two-Phase Flow Device Qualification, Phase I

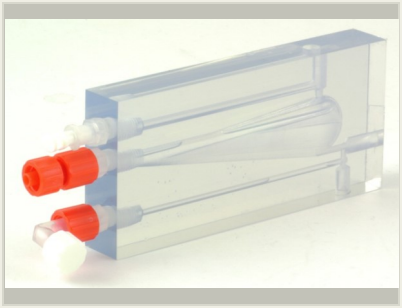
Completed Technology Project (2015 - 2015)

Project Introduction

Nearly all fluid systems aboard spacecraft are, or become, multiphase fluid systems, whether by design or default. This is due to the natural and simultaneous presence of gases and liquids in critical life support equipment, thermal control systems, power systems, and propulsion systems. With such a broad-base presence system designers must achieve a greater understanding of low-g fluid interfacial phenomena to assure performance and avoid system failure. This is both a key and critical point. In essence, designers are operating blind to multiphase functions, lacking tools and qualified components to properly design critical systems. Our concept testbed seeks to alleviate that by qualifying capillary two-phase devices in-situ aboard Space Station that when exhaustively probed will definitively qualify devices with clear specifications on performance, operating conditions, and appropriate integration for important families of conduits, container geometries, and devices. The design applies the recent results of experiments conducted on ISS to exploit capillary forces in a novel manner to assure passive phase separation processes that permit continuous 2-phase circulation in a simple closed loop with expectations of dramatic increases in data collection rates. Our Phase I objective is a low-g drop tower-demonstrated, capillary fluidics prototype testbed. We will also establish a clear plan for the rapid construction and flight qualification of a flight version for verification and validation aboard ISS. Our Phase II/III goal is to flight-qualify and fly a system aboard the ISS on a short schedule, interfacing with any variety of ISS facilities.

Primary U.S. Work Locations and Key Partners





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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Irpi, LLC	Lead Organization	Industry	Wilsonville, Oregon
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Oregon

Project Transitions

June 2015: Project Start

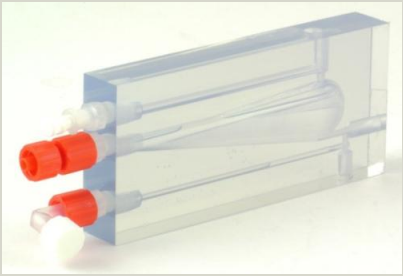
December 2015: Closed out

Closeout Summary: ISS Testbed for Capillary Two-Phase Flow Device Qualification, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139142)*

Images



Briefing Chart Image
ISS Testbed for Capillary Two-Phase Flow Device Qualification, Phase I
(https://techport.nasa.gov/image/131135)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Irpi, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

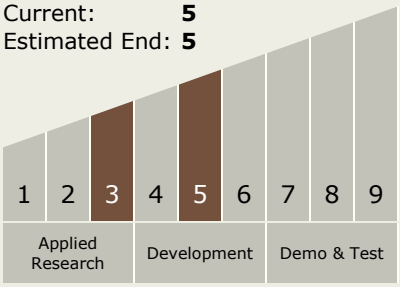
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Ryan Jenson

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.2 Water Recovery and Management

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System